



► innovation in
REBROADCASTING since 1962

CANAM TECHNOLOGY, Inc.

MARK-IV BROADBAND AMPLIFIERS

USER'S MANUAL

REVISION 3
Jan 2006



► innovation in
REBROADCASTING since 1962

MARK-IV BROADBAND AMPLIFIERS
User's Manual

TABLE OF CONTENTS

Section A.	Introduction	3
Section B.	GLOSSARY OF TERMS.....	5
Section C.	THEORY OF OPERATION	6
Section D.	SPECIFICATIONS	7
Section E.	INSTALLATION.....	8
E.1	Equipment Installation	8
E.2	Antenna Installation.....	10

Section A. Introduction

This document is the MARK-IV Broadband Amplifiers User's Manual, intended for the Radio Technical Personnel.

The Mark-IV Broadband Amplifiers are highly-linear devices suitable for applications in the two-way radio and cellular UHF and 800 MHz bands.

They are intended for use in low to mid power amplification and re-amplification systems, including land-mobile radio and cellular uni- and bi-directional signal booster systems.

These amplifiers utilize linear LDMOS power devices that provide high gain, wide dynamic range, and excellent group delay and phase linearity.

Exceptional performance, long term reliability, and high efficiency are achieved by employing advanced matching networks and combining techniques, EMI/RFI filters, machined housings, and qualified components.

Models:

UHF band: M4-BBDA-U, FCC ID: TCJ-M4BBDAU

800 MHz band: M4-BBDA-8, FCC ID: TCJ-M4BBDA8

Key Features:

- Solid-state, ultra-linear design
- High reliability and ruggedness.
- Built-in high dynamic range with Automatic Level Control (ALC) circuit.
- Built-in Output Circulator
- Built-in monitoring circuits, DC signal at interface connector:
 - Forward Power Detector
 - Reverse Power Detector



General Disclaimers

This manual is intended to be used with the MARK-IV Equipment only. It is not to be used with any other equipment unless it is authorized by Canam Technology, Inc.

Canam Technology, Inc provide this document "as is" without any warranty of any kind. This document may contain typographical errors and technical inaccuracies. Canam Technology will not accept any liability from the use and misuse of this manual, the information contained within, or the consequences of any actions resulting from the use of this information.

The user can not make any modifications to the unit(s). Changes or modifications not expressly approved by the party responsible for compliance voids the user's authority to operate the equipment.



Radio-Frequency Amplifiers such as the MARK-IV generate radio signals and, therefore, electromagnetic fields. The technical personnel should have a complete understanding of FCC CFR Title 47 sections 1.1307 and 1.1310. Recommendations are included in this Manual, but they do not substitute the FCC guidelines.



This device may require the use of antennas for proper functioning, depending on the application. The installation of the antennas should be performed by qualified technical personnel. All antennas should be fixed mounted and physically secured to one location. **The people must be away from the antennas at least 1.0 meters to comply with the RF Human Maximum Permissible Exposure limits, as long as the antenna system gain is lower than 0 dBi.** If greater gain is used the separation should be increased, please refer to the FCC Rules.

If service should be performed on the antenna, please shut down the transmitter or lower its power in order to comply with the maximum permissible exposure.

Section B. GLOSSARY OF TERMS

AC: Alternating Current.

Broadband Amplifier: A device at a fixed location which automatically receives, amplifies, and retransmits the signals received from base, fixed, mobile, and portable stations, with no change in frequency or authorized bandwidth. All signals within the passband of the amplifier filter are amplified.

DC: Direct Current.

Rx: Receiver or Input Port.

Tx: Transmitter or Output Port.

Section C. THEORY OF OPERATION

The **MARK-IV** BROADBAND AMPLIFIERS are self contained modules having the RF Input and Output ports via SMA-type coaxial connectors and DC plus Control signals via D-Subminiature 9-pin connector.

These amplifiers modules must be installed on appropriate heat-sinks to dissipate the heat they generate during normal operation (with or without input signal). It is recommendable the Case Temperature not to exceed 50 degrees Celsius to benefit the amplifier's life span.

The RF Input signal is amplified by the amplifier's gain and delivered at the RF Output without changes in frequency, modulation or occupied bandwidth.

$$P_{out} = P_{in} + \text{Gain}$$

The **MARK-IV** BROADBAND AMPLIFIERS are equipped with Automatic Level Control (ALC) circuitry to limit the output power to the factory preset level, preventing that an input drive signal level plus the amplifier's gain would exceed the maximum authorized output power level. In that case, the ALC circuit will proportionally decrease the gain as required not to exceed the preset output level. A red LED on the side of the amplifier's case is lit when the ALC circuit is in operation.

The amplifiers are also equipped with Input Overdrive Protection (passive "fuse-type") to prevent further damage of its internal stages in case of accidental very strong signals well above the maximum input level required for normal operation.

The **MARK-IV** BROADBAND AMPLIFIERS requires an external DC Power Supply, typical +28 VDC. They can operate at +24 VDC with approximately 1 dB reduction on gain and linearity performance. The current draw is less than 4 Amps at maximum output power.

MARK-IV BROADBAND AMPLIFIERS
User's Manual

Section D. SPECIFICATIONS

ELECTRICAL SPECIFICATIONS @ VDD=+28VDC, T=25°C, 50Ω System

Model	Symbol	UHF Band 400 – 512 MHz			800 MHz Band 806 - 870 MHz			Unit
		F _L	F _M	F _H	F _L	F _M	F _H	
Maximum Operating Output Power, limited by ALC.	P _{OP}	5			15			Watt
P1dB G.C.P.	P _{1dB}	25			50			Watt
Small Signal Gain	SSG	38	45	46	40	45	45	dB
Small Signal Gain Flatness	ΔG	±0.5			±0.75			dB
Input/Output VSWR	S11/S22	1.5:1 typ.			1.5:1 typ.			-
Harmonics	H	< -13			< -13			dBm
Noise Figure	NF	7 typ.			7 typ.			dB
Spurious Signals	Spur	-60			-60			dBc
Supply Current (UHF@4W, 7-800@12W composite power)	IDD	2			4			Amps
Operating Voltage	VDD	+28			+28			Volts DC

ENVIRONMENTAL CHARACTERISTICS & PROTECTIONS

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	T _c	0		+50	°C
Storage Temperature	T _{stg}	-40		+85	°C
Input Overdrive			+6dBm for -U model, +10 dBm for -8 model		
Load VSWR @ nominal output power			Infinite @ all load phase & amplitude		
Thermal Overload			85°C shutdown		

Monitoring Functions

Parameter	Typical Specifications
Forward Power Monitor	Continuous Analog voltage relative to forward power via RMS detector. -U Model: FWDM: 13 - 43dBm @ 0 - 5V (200mV/dB). 28dBm output = V _{FWD} = 2.5VDC -8 Model: FWDM: 17 - 47dBm @ 0 - 5V (200mV/dB)
Reverse Power Monitor	Continuous Analog voltage relative to reflected power via RMS detector. -U Model: REVM: 6 - 36dBm @ 0 - 5V (150mV/dB) -8 Model: REVM: 12 - 42dBm @ 0 - 5V (150mV/dB)
Mute	Enable: TTL "Low". Disable: TTL "High"

Section E. INSTALLATION

E.1 Equipment Installation

Canam Technology's Equipment is factory configured. All setup and wiring is performed by Canam's Personnel. There is no need to disconnect the equipment unless the units should be serviced.



Warning: if any module should be disconnected, it should only be performed by qualified technical personnel.

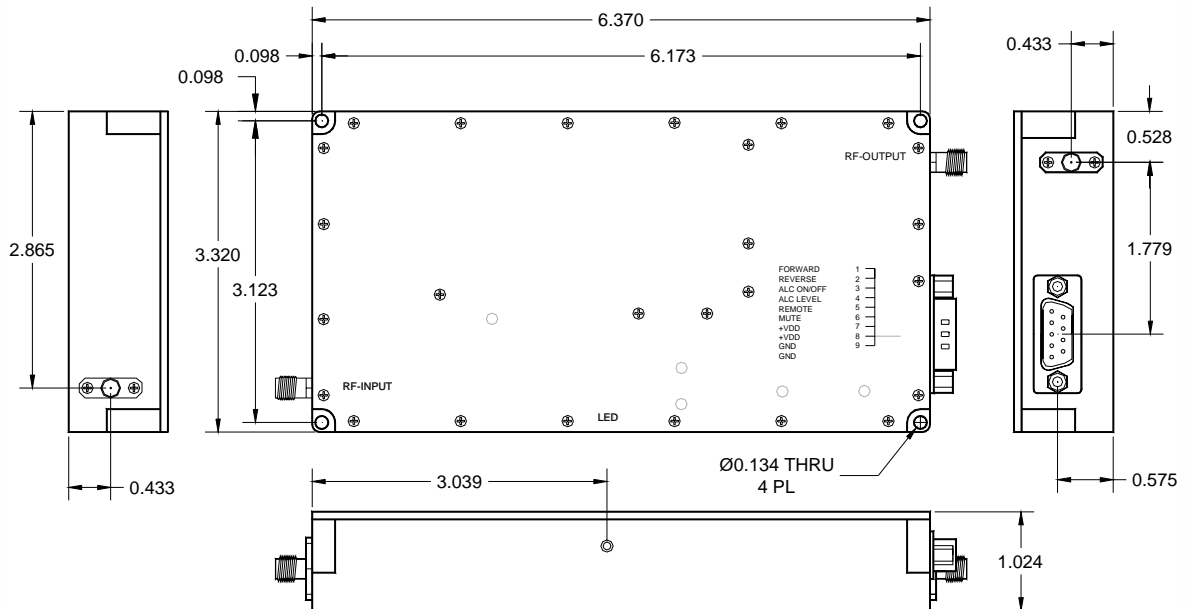


Figure 1: MARK-IV BBDA 800 MHz-band Mechanical Outline (Units in inches)

MARK-IV BROADBAND AMPLIFIERS
User's Manual

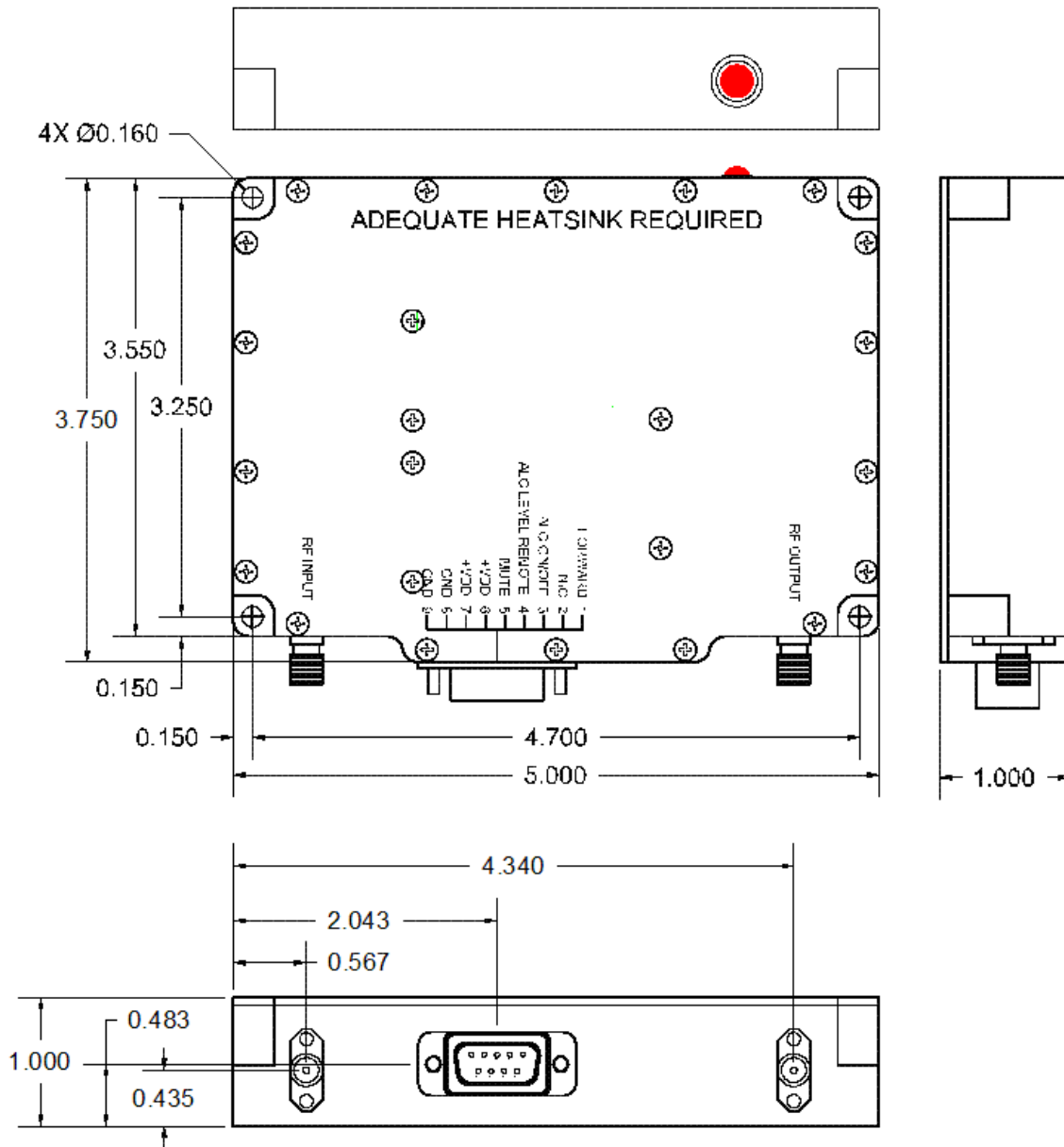


Figure 2: MARK-IV BBDA UHF-band Mechanical Outline (Units in inches)

E.2 Antenna Installation



The Input antenna and output antenna are not included with this equipment. Nevertheless, if this device is used in an application that requires direct connection to an antenna, Canam Technology recommends following the FCC guidelines for its installation:

- Antenna Installation should be performed by qualified technical personnel.
- The installations instructions are for the purpose of complying with FCC RF Exposure and are not optional.
- All antennas (Donor and Service) should be fixed mounted and physically secured to one location.
- Non-building mounted donor antennas must be greater than 10 meters above ground.
- Minimum Separation to any body's part of any person is 1 meter, as long as the System Antenna Gain is lower than 0 dBi.
- The Maximum System Antenna Gain should be as follows for each model:
 - For MARK-IV 800-band model **M4-BBDA-8**: $G < 0$ dBi.
 - For MARK-IV UHF-band model **M4-BBDA-U**: $G < -3$ dBi.



► innovation in
REBROADCASTING since **1962**

MARK-IV BROADBAND AMPLIFIERS
User's Manual

(This page is intentionally left blank)